



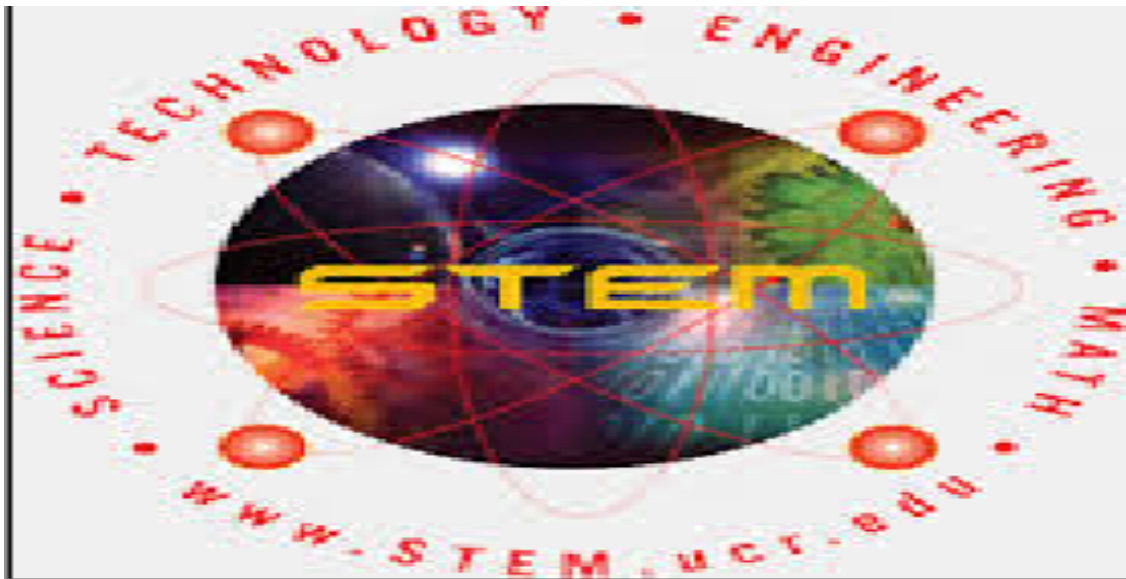
ثانوية التكنولوجيا التطبيقية
Applied Technology High School



المدرسة الثانوية الفنية
Secondary Technical School



Grade 11 Core MATH STEM – Project Term 2



Student Names:

SCORE

❖ Student 1:	
❖ Student 2:	
❖ Student 3:	
❖ Student 4:	

THE PROJECT'S DEADLINE IS ON 28 – FEBRUARY – 2015



Project's Outline

The project has four tasks:

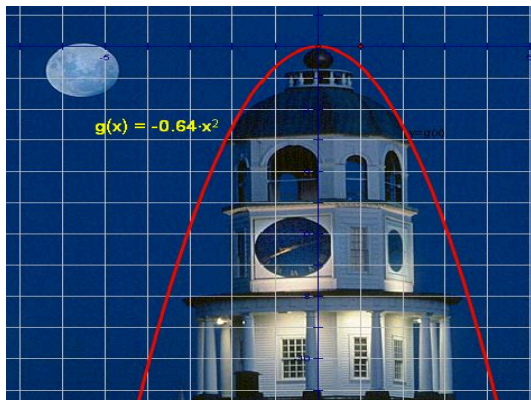
Task 1: Collect and organize the data.

Task 2: Determine a polynomial model that best fits a data set

Task 3: Project your polynomial model using the projectile.

Task 4: Estimation of price using graph.

Present a video, powerpoint, Blog or i-movie with your Model.



$$\begin{aligned} & x^2 + 7x - 3 \\ & 4a^3 + 7a^2 + a \\ & nm^2 - m \\ & 3x - 2 \\ & 5 \end{aligned}$$

Task 1: Engineering

- Get a bottle with a circular base, a flat bottom, and curved sides. Measure the diameter of the circular base in centimeters. Calculate the radius.
- Pour water into the bottle until the bottle is approximately half full. Place a cap on the bottle, and measure the height h_1 of the water, in centimeters. The volume W in milliliters of the part of the bottle containing water can be approximated by $W(r) = \pi r^2 h_1$.
- Calculate the approximate volume of this part of the bottle.
- Turn the bottle upside-down and measure the height h_2 of the air above the water, in centimeters. The volume A in milliliters of the air space can be approximated by $A(r) = \pi r^2 h_2$.
- The total volume of the of the bottle in milliliters can be modeled by the polynomial function in variable r :

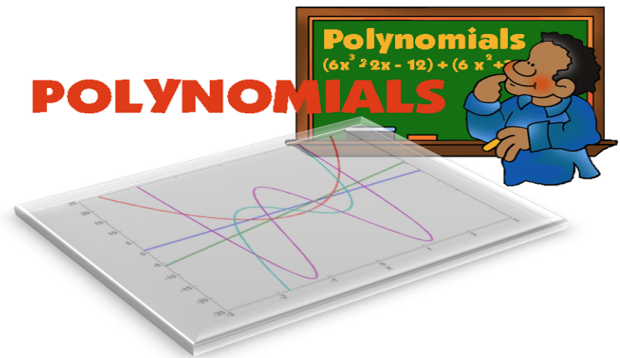
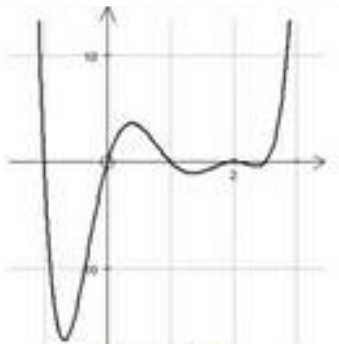
$$V(r) = W(r) + A(r) = \pi r^2 h_1 + \pi r^2 h_2.$$

- Find the total volume of the bottle V .



Task 2 - Technology

1. Using technology software of your choice, graph each function in a xy coordinate plane. For each function, answer questions a and b below.



$$f(x) = x^2 - 8x + 12$$

$$g(x) = x^3 - 3x + 2$$

$$h(x) = -x^4 + 4x - 3$$

$$j(x) = -x^5 + 5x - 4$$

a) Describe the end behavior of each graph and state whether the degree of the function is even or odd.

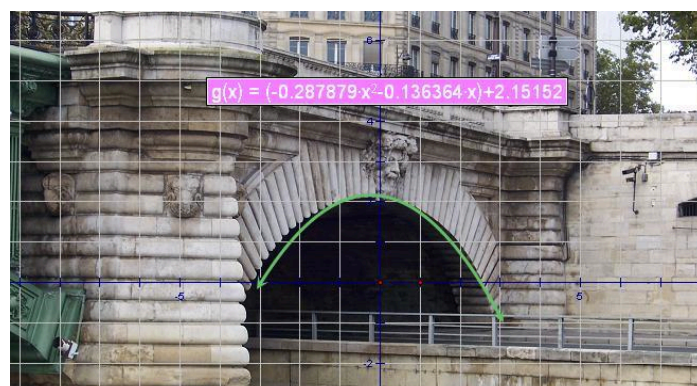
b) Find the number of real zeros for each function.

2. Referring to the bottle from Task 1, if the height h_1 is 1 unit less than the radius r , and the height h_2 is 2 less than the radius r , write the polynomial function for the total volume $V(r)$ in terms of r .

3. Graph the function that you find in step 2.

4. Compare the graph from step 3

to the graphs from step 1. How are they alike? How are they different?



Task 3 - Mathematics

The average price of a gallon of gas at the beginning of each month for the period starting in November 2010 and ending in May 2011 are given in the margin. The data is plotted in Fig 5.18 and fitted with the following third degree polynomial, where t is the number of months that have passed since October 2010.

$$p(t) = -0.0080556t^3 + 0.11881t^2 - 0.30671t + 3.36$$

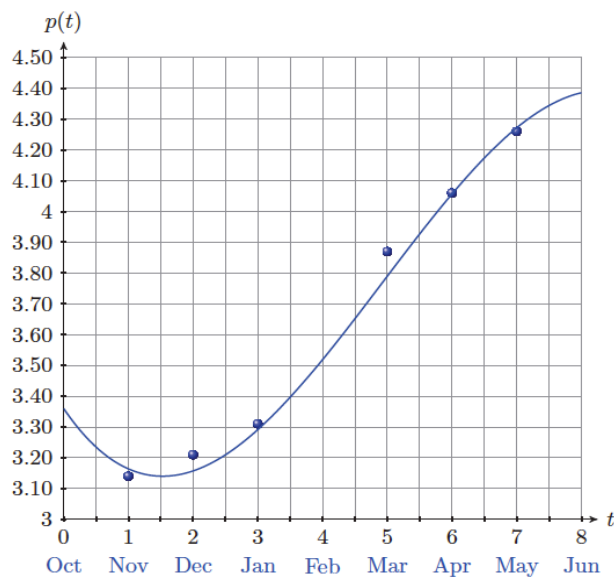
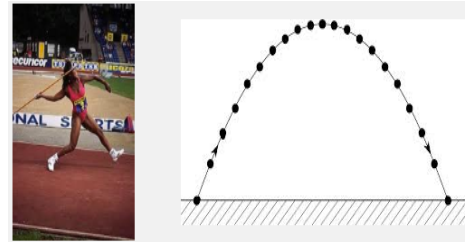
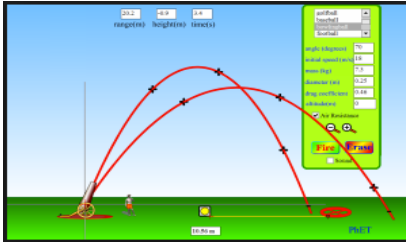


Figure 5.18: Fitting gas price versus month with a cubic polynomial.

Month	Price
Nov.	3.14
Dec.	3.21
Jan	3.31
Mar.	3.87
Apr.	4.06
May	4.26

Use the graph and then the polynomial, to estimate the price of a gallon of gas in California in February 2011.

Projectile (Any object propelled through space by the application of force)



Task 4 - Science

If a projectile is fired into the air, its height above ground at any time is given by the formula:

$$y = y_0 + v_0 t - \frac{1}{2} g t^2,$$

where:

y = height above ground at time t

y_0 = initial height above ground at time $t = 0$,

v_0 = initial velocity at time $t = 0$,

g = acceleration due to gravity,

t = time passed since projectile's firing.

If a projectile is launched with an initial velocity of 100 meters per second (100m/s) from a rooftop 8 meters (8m) above ground level, at what time will the projectile first reach a height of 400 meters (400m)? (Note: Near the earth's surface, the acceleration due to gravity is approximately 9.8 meters per second (9.8 m/s^2))

• Rubrics

	4	3	2	1	
Completeness of Tasks 20%	Tasks are totally completed and correct. (100%)	Tasks are partially completed, OR Partially wrong.(75%)	Tasks are partially completed, AND Partially wrong (50%).	Tasks are Attempted (25% or less)	—
Presentation and Integration of Technology 70%	Students used one mean of technology. The tool used helped the student and was useful to support his project. Moreover, the student was able to explain the work he/she submitted confidently and fluently; he/she was <u>able to answer all</u> of colleagues and instructor's questions	Student used a mean of technology but it was not that supportive to the topic. In addition, student was able to explain the work he/she submitted confidently and fluently and he/she reflected an understanding of his/her works. The student was <u>able to answer most</u> of colleagues and instructor's questions.	Student was able to explain the work he/she submitted. Student reflected a shallow understanding of his/her work; she was <u>able to answer some</u> of colleagues and instructor's questions,	Student use of technology was primitive and way below the level of other IAT students. Student was unable to explain the work he/she submitted. Student reflected no understanding of his/her work; he/she was <u>unable to answer any</u> of colleagues and instructor's questions.	—
Creativity & enrichment 10%	Student had an outstanding addition in <u>all aspects</u> of his/her project.	Student had an outstanding addition in <u>some aspects</u> of his/her project.	Student had an outstanding addition in <u>very few aspects</u> of his/her project.	Student had an outstanding addition in <u>no aspects</u> of his/her project.	—
This rubric is out of 100, percentage orientation.				Total—>	—